Claims

[c1] 1. A method of obtaining a spatially representative sample of fluid flowing through a duct, the method comprising:
determining an average concentration of a component species of the fluid flowing through the duct during a test which includes determining a first concentration of the component species at a first location within the duct and determining a second concentration of the component species at a second location within the duct;
positioning a first sample probe in the duct so that the first sample probe receives a portion of the fluid at the first location;
positioning a second sample probe in the duct so that the second sample probe receives a portion the fluid at the second location; and
controlling respective flow rates of fluid received by the first and second sample probes based on the first concentration of the component species, the second concentration of the component species and the average concentration of the component species.

[c2] 2. A method of claim 1 wherein the respective flow rates

are controlled so that a concentration of the component species of the fluid collectively received by the first and second sample probes equals the average concentration of the component species determined during the test.

[c3] 3. A method of claim 1 wherein the first and second concentrations of the component species determined during the test are different from each other.

[c4] 4. A method of claim 1 wherein the fluid is received by the first and second sample probes concurrently.

[c5] 5. A method of claim 1 wherein the flow rate of the fluid received by the first sample probe is controlled by a first flow controller connected to the first sample probe and the flow rate of the fluid received by the second sample probe is controlled by a second flow controller connected to the second sample probe.

[c6] 6. A method of claim 1 wherein the test is a stratification test.

[c7] 7. A method of claim 1 wherein the component species is at least one of O2, CO2, CO, SO2 and NOx.

[c8] 8. A method of claim 1 wherein determining the average concentration of the component species during the test further includes determining at least a third concentra-

tion of the component species of the fluid at at least a third location within the duct, and further comprising positioning at least a third sample probe so that the third sample probe receives a portion of the fluid at the third location and controlling respective flow rates of fluid received by the first, second and third sample probes based on the first, second and third concentrations of the component species determined during the test and the average concentration of the component species determined by the test.

[c9] 9. A method of claim 8 wherein the respective flow rates of fluid received by the first, second and third sample probes are controlled so that a concentration of the component species collectively received by the first, second and third sample probes equals the average concentration of the component species determined during the test.

[c10] 10. A method of claim 8 wherein the first, second and third concentrations of the component species determined during the test are different from each other.

[c11] 11. A method of obtaining a spatially representative sample of fluid flowing through a duct, the method comprising:
determining an average concentration of a component

species of the fluid flowing through the duct during a test which includes determining a first concentration of the component species at a first location within the duct and determining a second concentration of the component species at a second location within the duct;
positioning a first sample probe in the duct so that the first sample probe receives a portion of the fluid at the first location;
positioning a second sample probe in the duct so that the second sample probe receives a portion of the fluid at the second location; and
controlling a first amount of time that the flow of fluid is received by the first sample probe and a second amount of time that the flow of fluid is received by the second sample probe based on the first concentration of the component species, the second concentration of the component species and the average concentration of the component species.

[c12] 12. A method of claim 11 wherein the first amount of time and the second amount of time are controlled so that a concentration of the component species of the fluid collectively received by the first and second sample probes equals the average concentration of the component species determined during the test.

[c13] 13. A method of claim 11 wherein the first and second concentrations of the component species determined during the test are different from each other.

[c14] 14. A method of claim 11 wherein the fluid is received by the first and second sample probes non-concurrently.

[c15] 15. A method of claim 14 further comprising venting fluid from the first sample probe when fluid is being received by the second sample probe.

[c16] 16. A method of claim 15 further comprising venting fluid from the second sample probe when the fluid is being received by the first sample probe.

[c17] 17. A method of claim 11 wherein the first amount of time that the fluid is received by the first sample probe is controlled by a first flow controller connected to the first sample probe and the second amount of time that the fluid received by the second sample probe is controlled by a second flow controller connected to the second sample probe.

[c18] 18. A method of claim 17 wherein at least one of the first and second flow controllers is coupled to both a sample pump and a venting pump.

[c19] 19. A method of claim 17 wherein the first flow con-

troller vents fluid from the first sample probe when the second flow controller communicates fluid received by the second flow controller to a sample pump.

[c20] 20. A method of claim 19 wherein the second flow controller vents fluid from the second sample probe when the first flow controller communicates fluid received by the first flow controller to a sample pump.

[c21] 21. A method of claim 11 wherein the flow rate of fluid received by the first sample probe is equal to the flow rate of fluid received by the second sample probe.

[c22] 22. A method of claim 11 wherein the test is a stratification test.

[c23] 23. A method of claim 11 wherein the component species is at least one of O2, CO2, CO, SO2 and NOx.

[c24] 24. A method of claim 11 wherein the fluid received by at least one of the first and second sample probes is received isokinetically.

[c25] 25. A method of claim 11 wherein determining the average concentration of the component species during the test further includes determining at least a third concentration of the component species of the fluid at at least a third location within the duct, and the first amount of

time, the second amount of time and at least a third amount of time that fluid is received by at least a third sample probe at the third location is controlled based on the first, second and third concentrations of the component species determined during the test and the average concentration of the component species determined by the test.

[c26] 26. A method of claim 25 wherein the first, second and third amounts of time that fluid is respectfully received by the first, second and third sample probes are controlled so that a concentration of the component species collectively received by the first, second and third sample probes equals the average concentration of the component species determined during the test.

[c27] 27. A method of claim 25 wherein the first, second and third concentrations of the component species determined during the test are different from each other.

[c28] 28. A system for obtaining a spatially representative sample of fluid flowing through a duct in which an average concentration of a component species of the fluid flowing through the duct has been determined during a test which includes determining a first concentration of the component species at a first location within the duct and determining a second concentration of the compo-

nent species at a second location within the duct, the system comprising:

a first sample probe positioned in the duct so that the first sample probe receives a portion of the fluid at the first location; and

a second sample probe positioned in the duct so that the second sample probe receives a portion the fluid at the second location;

wherein respective flow rates of fluid received by the first and second sample probes are controlled based on the first concentration of the component species, the second concentration of the component species and the average concentration of the component species.

[c29] 29. A system of claim 28 wherein the respective flow rates are controlled so that a concentration of the component species of the fluid collectively received by the first and second sample probes equals the average concentration of the component species determined during the test.

[c30] 30. A system of claim 28 wherein the first and second concentrations of the component species determined during the test are different from each other.

[c31] 31. A system of claim 28 wherein the fluid is received by the first and second sample probes concurrently.

[c32] 32. A system of claim 28 wherein the flow rate of the fluid received by the first sample probe is controlled by a first flow controller connected to the first sample probe and the flow rate of the fluid received by the second sample probe is controlled by a second flow controller connected to the second sample probe.

[c33] 33. A system of claim 32 wherein the first and second flow controllers are operatively connected to a computerized control system.

[c34] 34. A system of claim 28 wherein determining the average concentration of the component species during the test further includes determining at least a third concentration of the component species of the fluid at at least a third location within the duct, and the system further comprises at least a third sample probe positioned so that the third sample probe receives a portion of the fluid at the third location and controlling respective flow rates of fluid received by the first, second and third sample probes based on the first, second and third concentrations of the component species determined during the test and the average concentration of the component species determined by the test.

[c35] 35. A system of claim 34 wherein the respective flow

rates of fluid received by the first, second and third sample probes are controlled so that a concentration of the component species collectively received by the first, second and third sample probes equals the average concentration of the component species determined during the test.

[c36] 36. A system of claim 34 wherein the first, second and third concentrations of the component species determined during the test are different from each other.

[c37] 37. A system for obtaining a spatially representative sample of fluid flowing through a duct in which an average concentration of a component species of the fluid flowing through the duct has been determined during a test which includes determining a first concentration of the component species at a first location within the duct and determining a second concentration of the component species at a second location within the duct, the system comprising:
a first sample probe positioned in the duct so that the first sample probe receives a portion of the fluid at the first location; and
a second sample probe positioned in the duct so that the second sample probe receives a portion of the fluid at the second location;
wherein a first amount of time that the flow of fluid is

received by the first sample probe and a second amount of time that the flow of fluid is received by the second sample probe are controlled based on the first concentration of the component species, the second concentration of the component species and the average concentration of the component species.

[c38] 38. A system of claim 37 wherein the first amount of time and the second amount of time are controlled so that a concentration of the component species of the fluid collectively received by the first and second sample probes equals the average concentration of the component species determined during the test.

[c39] 39. A system of claim 37 wherein the first and second concentrations of the component species determined during the test are different from each other.

[c40] 40. A system of claim 37 wherein the fluid is received by the first and second sample probes non-concurrently.

[c41] 41. A system of claim 40 wherein fluid is vented from the first sample probe when fluid is being received by the second sample probe.

[c42] 42. A system of claim 41 wherein fluid is vented from the second sample probe when the fluid is being received by the first sample probe.

[c43] 43. A system of claim 37 wherein the first amount of time that the fluid is received by the first sample probe is controlled by a first flow controller connected to the first sample probe and the second amount of time that the fluid received by the second sample probe is controlled by a second flow controller connected to the second sample probe.

[c44] 44. A system of claim 43 wherein the first and second flow controllers are operatively connected to a computerized control system.

[c45] 45. A system of claim 43 wherein at least one of the first and second flow controllers is coupled to both a sample pump and a venting pump.

[c46] 46. A system of claim 43 wherein the first flow controller vents fluid from the first sample probe when the second flow controller communicates fluid received by the second flow controller to a sample pump.

[c47] 47. A system of claim 46 wherein the second flow controller vents fluid from the second sample probe when the first flow controller communicates fluid received by the first flow controller to a sample pump.

[c48] 48. A system of claim 37 wherein the flow rate of fluid

received by the first sample probe is equal to the flow rate of fluid received by the second sample probe.

[c49] 49. A system of claim 37 wherein the fluid received by at least one of the first and second sample probes is received isokinetically.

[c50] 50. A system of claim 37 wherein determining the average concentration of the component species during the test further includes determining at least a third concentration of the component species of the fluid at at least a third location within the duct, and the first amount of time, the second amount of time and at least a third amount of time that fluid is received by at least a third sample probe at the third location is controlled based on the first, second and third concentrations of the component species determined during the test and the average concentration of the component species determined by the test.

[c51] 51. A system of claim 50 wherein the first, second and third amounts of time that fluid is respectfully received by the first, second and third sample probes are controlled so that a concentration of the component species collectively received by the first, second and third sample probes equals the average concentration of the component species determined during the test.

[c52] 52. A system of claim 51 wherein the first, second and third concentrations of the component species determined during the test are different from each other.

[c53] 53. A system for obtaining a spatially representative sample of fluid flowing through a duct in which an average concentration of a component species of the fluid flowing through the duct during a test which includes determining a first concentration of the component species at a first location within the duct and determining a second concentration of the component species at a second location within the duct, the system comprising:

a first means for sampling positioned in the duct so that the first means for sampling receives a portion of the fluid at the first location;

at least a second means for sampling positioned in the duct so that the second means for sampling receives a portion the fluid at the second location; and

means for controlling respective flow rates of fluid received by the first and second means for sampling based on the first concentration of the component species, the second concentration of the component species and the average concentration of the component species.

[c54] 54. A system of claim 53 wherein the respective flow

rates are controlled by the means for controlling so that a concentration of the component species of the fluid collectively received by the first and second means for sampling equals the average concentration of the component species determined during the test.

[c55] 55. A system of claim 53 wherein the first and second concentrations of the component species determined during the test are different from each other.

[c56] 56. A system of claim 53 wherein the fluid is received by the first and second means for sampling concurrently.

[c57] 57. A system for obtaining a spatially representative sample of fluid flowing through a duct in which an average concentration of a component species of the fluid flowing through the duct during a test which includes determining a first concentration of the component species at a first location within the duct and determining a second concentration of the component species at a second location within the duct, the system comprising:

a first means for sampling positioned in the duct so that the first means for sampling receives a portion of the fluid at the first location;

at least a second means for sampling positioned in the duct so that the second means for sampling receives a

portion of the fluid at the second location; and
means for controlling a first amount of time that the flow of fluid is received by the first means for sampling and a second amount of time that the flow of fluid is received by the second means for sampling based on the first concentration of the component species, the second concentration of the component species and the average concentration of the component species.

[c58] 58. A system of claim 57 wherein the first amount of time and the second amount of time are controlled by the means for controlling so that a concentration of the component species of the fluid collectively received by the first and second means for sampling equals the average concentration of the component species determined during the test.

[c59] 59. A system of claim 57 wherein the first and second concentrations of the component species determined during the test are different from each other.

[c60] 60. A system of claim 57 wherein the fluid is received by the first and second means for sampling non-concurrently.

[c61] 61. A system of claim 60 wherein fluid from the first means for sampling is vented when fluid is being re-

ceived by the second means for sampling.

[c62] 62. A system of claim 61 wherein fluid from the second means for sampling is vented when the fluid is being received by the first means for sampling.

[c63] 63. A system of claim 57 wherein the flow rate of fluid received by the first means for sampling is equal to the flow rate of fluid received by the second means for sampling.